RC2: 'Comment on egusphere-2024-3101', Anonymous Referee #2, 07 Feb 2025 reply

This study is relevant and necessary as it provides insight into the performance of portable X-ray devices. However, the article would benefit from a clearer structure and a well-defined research question to better guide the reader.

- **We appreciate this valuable feedback. To enhance clarity, we will explicitly define the main research question at the end of the Introduction section, clearly stating: *"What is the accuracy, precision, and practical applicability of portable X-ray fluorescence (PXRF) in evaluating metal contamination specifically within urban soils, and under what conditions does its performance vary?"* We will also reorganize the manuscript structure, clearly linking each subsequent section back to this central research question.**

Currently, the inclusion of numerous individual studies makes it difficult to follow, especially since they are not always synthetized or compared to one another—which should be a key objective of a review.

- **We agree with the reviewer's concern. To resolve this, we will restructure and significantly enhance the manuscript by:**
- **Synthesizing key findings of the reviewed studies into concise summary tables (e.g., comparisons of calibration methods, PXRF accuracy by element, and conditions influencing results).**
- **Clearly highlighting commonalities and discrepancies across the reviewed studies, including explicit comparisons of R^2 values, detection limits, and element-specific accuracy and precision.**
- **Providing integrative commentary that explicitly compares methodologies, limitations, and practical implications drawn from across the reviewed literature.**

Additionally, the study lacks detail on the choice of the urban setting, which could have a significant impact on the findings.

- **We acknowledge this critical point. We will clearly state that urban soils present specific analytical challenges due to their heterogeneous nature, history of anthropogenic contamination, and complex land-use patterns. We will expand on how these urban-specific factors distinctly impact PXRF performance compared to other contexts such as agricultural or natural soils, thus emphasizing the significance of the urban soil focus of this review.**

Besides, the authors tends to wrote several times some informations for instance about the soil moisture/OM or mode choice importance. This make the paper hard to read and without any clear onlusion while such study could have been helpful for choice in measurement technic.

- **We agree with this observation. We will carefully revise the manuscript to eliminate redundant statements regarding soil moisture, organic matter, and PXRF operational**

modes. We will consolidate this information into clearly organized subsections or dedicated paragraphs that systematically address these factors once, providing explicit recommendations and conclusions for each, thereby significantly improving readability and coherence.

Finally, I'm not conviced about the "performance status" the authors accepted. In some cases there is a factor 2 to 3 between ICP and PXRF measurement which seems quiet high.

- **We thank the reviewer for highlighting this important concern. We will explicitly address the acceptable performance standards more clearly in the manuscript by:**
- **Providing a clear justification of accepted thresholds for differences between PXRF and laboratory (ICP-based) measurements, referencing established guidelines and best practices from the literature.**
- **Clarifying under which circumstances (elements, concentration ranges, measurement settings) these deviations occur, and explicitly discussing their practical implications and limitations.**
- **Proposing clear guidelines and caveats for users interpreting PXRF data in light of these variations, including recommendations for calibration and confirmation of critical findings through ICP-based methods.**

Other comments,
*L. 29 I think a “d” is missing in “foo security”

- **Thank you for pointing this out. The typo will be corrected from "foo security" to "food security"**.

*L. 80 “Articles that provided background information on the PXRF and heavy metal pollution l. 82 was also used in this review.” I think it’s were instead of was.

- **Thank you for this correction. We will revise the sentence to: "Articles that provided background information on PXRF and heavy metal pollution were also used in this review."**

* L.82 “During the search, there were articles that appeared via search engine - particularly on Google Scholar - that produced a number of articles that did not meet the criteria set and therefore was not relevant to the stud” sentence not clear

- **We will rewrite this sentence for greater clarity as follows: "During the literature search, particularly on Google Scholar, a number of retrieved articles did not meet the predefined inclusion criteria and thus were excluded from the review."**

* Figure 1 : not sure about the relevance of 1 flow chart for Wos and 1 for google scholar when the words searched are the same. The horizontal line between urban soil and HM in the WOS

flow chart is not horizontal. Please complete the lines or the legend by “and” or “or” or any other logical link they represent.

- **We appreciate this suggestion for improving Figure 1. To address your comment, we will:**
- **Consolidate the two separate flowcharts into one combined flowchart clearly distinguishing the steps and numbers of articles identified and included from each database.**
- **Clearly indicate logical operators between search terms within the flowchart.**

*Fig. 2 Not sure about the relevance of Fig.2. Maybe a chart with number of studies employing each type of XRF or at least each type of XRF with different specificity as described in paragraph 2.2 would be better?

- **We appreciate the reviewer’s suggestion. To address this, we will replace Figure 2 with a clear bar chart illustrating the** number of reviewed studies employing each PXRF instrument type**, as described in Section 2.2.**

*L. 262 “Researchers concluded that while XRF measurements can be reliable for certain elements like Pb, Ni, Zn, and Cu, they may not be as accurate for elements like Hg, Cd, Cr, and As, “ same sentence than l. 258 ;

- **We thank the reviewer for pointing out this redundancy. We will carefully revise and remove duplicate sentences to avoid repetition.**

* I’m a bit confused about the conclusion for table 1. You mentioned that Ni measurements with ICP and XRF are in close proximity while there is a factor 3 and no R2 ; same for Pb and Zn with a factor 2 between ICP and XRF.

- Thank you for highlighting this. We will clarify our interpretation of Table 1 by explicitly addressing these discrepancies.

* L. 280 “with Cd showing a slightly increasing trend at higher concentrations” Isn’t that Cu rather than Cr?

- Thank you for identifying this. We will carefully verify and correct this statement.

* L. 294 “Cubist modelling, which helped them obtain predictions of the results. The resulting data exhibited high skewness, with the PXRF having higher values for Lin’s Concordance correlation coefficient” please define or explain “cubist modelling” and “lin’s concordance”

- In the revised manuscript, we will briefly define and explain these terms clearly:

- **Cubist modelling: A statistical machine-learning method used for predicting continuous numeric outcomes from large datasets by creating predictive rule-based models.**

- **Lin's Concordance correlation coefficient (CCC): A statistical measure that quantifies agreement between two measurement methods, indicating both accuracy and precision simultaneously.**

* L.300 " The results obtained in research conducted by Schmidt et al. (2024) […] PXRF measurements for As and Pb", this look like a list of studies that performed or not … I'm not sure about the relevance of this paragraph after the table and fig.3. Maybe rephrase or complete to highlight the interest of detailing this study? Besides, l.263 the author wrote that method does not perform well for As ….

- **We agree with your concern. This paragraph will be rewritten to clearly highlight the significance of Schmidt et al.'s (2024) findings in the context of the review.**

* Table 2 not sure about "in situ r2" and "ex situ r2" is it the r2 between PXRF and ICP for in -situ (or ex situ) measurements? please detail the legend

- **We will improve the table legend accordingly.**

* Is paragraph 3.3 a "conclusion" about how to perform measurements ?

- **Paragraph 3.3 provides recommendations and practical considerations based on the reviewed studies rather than a formal conclusion. We will relabel it to avoid any confusion.**

* l. 390 "Portable XRF is effective and economic […]] for each heavy metal individually using traditional laboratory methods." Is that a concluding paragraph ? why an other paragraph of example after this one

- **We acknowledge this confusion. We will reorganize these sections clearly to separate our concluding statements from specific illustrative examples.**

* L.430 and 432 comments about the moisture and organic matter content have been wrote before

- **Thank you for highlighting this redundancy. We will remove repetitive references and consolidate our discussions of moisture and organic matter clearly into a single, comprehensive subsection to improve readability and clarity.**